

REMARKS

After the foregoing amendment, claims 1-31, as amended, are active in the present application. Claims 15 and 28 have been amended in order to more particularly point out and distinctly claim the Applicant's invention. No new matter has been added to the application as a result of the amendment of claims 15 and 28.

Formal Rejections

In the Office Action, claims 15 and 28 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. In particular, the Examiner rejected claim 15 because of the terminology "the infrared type" and rejected claim 28 because of a lack of proper antecedent basis. By the foregoing amendment, claim 15 has been amended to state that the camera is "an infrared camera". Similarly, claim 28 has been amended to insert the word "the" to provide proper antecedent basis for the housing. In view of the foregoing amendment to claims 15 and 28, it is respectfully submitted that the rejection under 35 U.S.C. § 112 has been overcome and should now be withdrawn.

Art Rejections

1) Claims 1, 4, 5, 9, 10, 13, 14, 23, 27, 28, 30 and 31 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5, 956,077 referred to as Qureshi et al. It is the position of the Examiner that the Qureshi et al. patent discloses an inspection method and apparatus for tanks which employs the same optical monitoring system as called for in the above enumerated claims for transmitting images from a hostile environment within the interior of a sealed chamber to the chamber exterior, the chamber having a wall and an access port extending through the wall. The Examiner further states that the monitoring system of Qureshi et al. comprises the same flexible, generally tubular elongated housing having a distal end and a proximal end and an interior and that the housing is made of non-porous or hermetically sealed corrosive resistant material. The Examiner further argues that the distal end of the Qureshi et al. housing includes a sealed window formed from a material selected from the group consisting of synthetic sapphire, glass, quartz and a polymeric material and that the window is secured to the

housing by a method selected from the group consisting of braising, fusion and an adhesive. It is also the Examiner's position that the proximal end of the housing of Qureshi et al. is sealingly secured to the chamber wall at the access port so that the interior of the housing is accessible through the port. Further, the Examiner states that the interior of the Qureshi et al. housing includes a transmission media for transmitting images of the interior of the chamber through the window from the distal end of the housing to the proximal end of the housing and through the port and that a monitor located outside of the chamber and connected to the transmission media is employed for receiving and displaying recorded images of the interior of the chamber. Finally, the Examiner states that the Qureshi et al. patent employs a video camera (41) positioned to record images of the interior of the chamber through the window, a sensor (41) for sensing a parameter of the hostile environment through the window and an apparatus (67) located outside of the chamber and connected to the transmission media for receiving and processing the sensor signal and displaying a representation of the sensor signal. For the reasons as set forth in detail below, the Applicant respectfully traverses the rejection of the enumerated claims based upon the Qureshi et al. patent.

The present invention comprises a monitoring system for monitoring or measuring one or more parameters or for providing visual inspections or otherwise obtaining information from within a harsh or hostile environment, such as within the interior of a sealed semiconductor wafer processing chamber. In one embodiment, as illustrated by Figs. 1-4, the invention comprises an optical monitoring system which includes a flexible, generally tubular elongated housing (12) having a distal end (14) and a proximal end (16). As best shown in Fig. 1, in the illustrated embodiment, the housing is comprised of a flexible, generally tubular elongated stainless steel bellows. As shown in Figs. 1 and 4, the proximal end of the housing is sealingly secured to the wall of a semiconductor wafer processing chamber or other sealed chamber containing the hostile environment. The distal end of the housing is also sealed and includes a sealed window (22) as best shown in Figs. 2 and 3. In this manner, the housing (12) is completely sealed so that the interior of the housing is completely isolated from the hostile environment within the semiconductor wafer processing chamber or other chamber. Establishing such a sealed, isolated environment within the interior of the housing is particularly important to provide protection for a borescope, camera or other sensor located within the sealed housing at

the distal end proximate to the window for capturing images or otherwise sensing parameters within the interior of the semiconductor wafer chamber or other sealed chamber.

The Qureshi et al. patent discloses an apparatus for visually inspecting the interior of an empty railroad tank car or similar generally cylindrical tank-like structure. The stated purpose in performing the visual inspection is to make sure that the interior of the tank car has not been corroded or otherwise damaged to the point where further use of the tank car could result in a leak of a chemical or other fluid contained within the tank car. The apparatus comprises a generally open vertically oriented tubular support (20) which is maintained above the tank car and which is adapted to be lowered downwardly to engage the mouth of the manway of the tank car. The lower end of the support (20) contains a conical guide (23) for causing the support to self align with the mouth of the manway in the manner as shown in Fig. 2. Importantly, the conical guide (23) is not said to be a “seal” nor does the patent state that the conical guide in any way functions to seal the lower end of the support to the manway opening. The interior of the support (20) includes an inspection arm (21) which is formed by a series of separate, articulated segments (31-36) which are sequentially connected by pivoting joints (37). Each pivoting joint includes an associated servo motor (28) to permit control of the articulation of the joint as shown sequentially in Figs. 2-6 of the Qureshi et al. patent. The leading articulated segment (31) includes a distal portion (31a) which, as shown in Fig. 8, is also capable of rotating under the control of an additional servo motor (42). The distal end portion (31a) includes a TV camera (41), a pair of illuminating lamps (49, 50) and a laser (51) which is used for measuring the distance between the distal end portion (31a) and the interior wall of the tank. By manipulating the individual articulated segments (31-36), the distal end portion (31a) of the first segment and by moving the cameral carrier (39) using a servo motor (44) an operator is able to effectively visually observe the interior of the empty railroad tank car as shown in Figs. 2-6.

Claim 1 of the present application calls for an optical monitoring system for transmitting images from a hostile environment “within the interior of a sealed chamber”. It is respectfully submitted that the tank car which is disclosed in the Qureshi et al. patent is not “a sealed chamber” as that term is defined and understood by claim 1. It is clear that the tank car includes an opening (the manway opening) which is totally open to atmosphere, at least when the

apparatus of the Qureshi et al. patent is being employed for inspecting the interior of the tank car. Further, as noted above, the upper end of the vertically oriented support (20) appears to be open to atmosphere, further confirming the fact that the interior of the tank car is not “a sealed chamber” at least at the time that the interior is being inspected by the Qureshi et al. device.

Claim 1 further calls for the optical monitoring system to include “a flexible generally tubular elongated housing... being made of a non-porous hermetically sealed corrosive resistant material”. It is abundantly clear when viewing the figures of the Qureshi et al. patent and in reading the text that the Qureshi et al. housing is not “hermetically sealed” nor is the housing “generally tubular”. To the extent that the entire apparatus is considered to be the housing, as noted above, it is clear that the upper end of the vertically oriented support (20) is open to atmosphere and, therefore, is not “hermetically sealed”. If alternatively, the six individual articulated segments are considered to be the housing, it is abundantly clear particularly from Fig. 8 that the articulated segments are not “hermetically sealed”. Moreover, while arguably each individual articulated segment may be considered to be “generally tubular” each of the individual articulated segments, themselves, are not flexible but, instead, they appear to be quite rigid in order to permit the apparatus to function as described. The only flexibility appears to be provided by the individual joints (37) which interconnect the rigid articulated segments. It is therefore respectfully submitted that the Qureshi et al. apparatus is not comprised of a flexible, generally tubular elongated housing and, even if it was, the “housing” of the Qureshi et al. apparatus is not “hermetically sealed”.

Claim 1 of the present application further calls for the distal end of the housing to include “a sealed window”. The Applicant can find nothing in the Qureshi et al. patent which meets this structural requirement of claim 1. Viewing Fig. 8, it is abundantly clear that the camera (41), lamps (49, 50) and laser measuring unit (51) are all completely open and are exposed to the environment because no “sealed window” is present or disclosed anywhere in the Qureshi et al. patent. As previously noted, since the Qureshi et al. device is employed for inspecting the interior of an empty tank car, there is no need for providing such a sealed window because the camera and other sensitive devices are clearly not expected to be exposed to a hostile

environment. Accordingly, it is respectfully submitted that the Qureshi et al. apparatus does not include "a sealed window" as called for in claim 1.

Finally, claim 1 calls for the proximal end of the housing to be "sealingly secured" to the chamber wall for the purpose of maintaining the sealed interior of the housing. In the Qureshi et al. apparatus, the conical guide (23) is employed "to allow the support casing to self align with the mouth of the manway (17)". There is no teaching or suggestion that the conical guide could in any way form a seal with the mouth of the manway. Moreover, as stated above, the upper end of the support (20) is clearly open to atmosphere. With the present invention, as shown in Fig. 4, the housing is sealingly secured to the wall of the semiconductor wafer processing chamber in order to maintain the sealed isolated environment within the interior of the housing. It is respectfully submitted that the Qureshi et al. patent does not disclose, teach or suggest any such sealing arrangement.

In view of the foregoing discussion, it is respectfully submitted that claim 1 is not anticipated by and distinguishes patentably over the Qureshi et al. patent.

Independent claims 9, 17, 23, 30 and 31 each recite substantially the same features as discussed above with respect to claim 1 and, therefore, are not anticipated by the Qureshi et al. patent for the same reasons as discussed above with respect to claim 1. Claims 4, 5, 10, 13, 14, 27 and 28 distinguish patentably over the Qureshi et al. patent at least by their dependency from claims 1, 9, 17 and 23.

Dependent claims 4, 5, 13, 14 and 27 relate to the material from which the sealed window is formed as well as the manner in which the window is secured to the housing. As noted above, the Qureshi et al. patent does not include any such window and, accordingly, does not disclose or suggest a manner for securing the window to the housing. In supporting his rejection of these claims, the Examiner states "see window in front of elements 39, 41, 48-51 of Fig. 8". However, the Applicant can identify no such window on Fig. 8 nor is there any statement that the applicant can identify in the Qureshi et al. specification which in any way refers to or confirms the presence of any such window. Moreover, the applicant can find no statement of any kind regarding how any alleged window is or could be secured to the housing. The Applicant

respectfully requests that the Examiner identify a specific portion of the specification in which the window is described along with the material for making the window and the manner in which the window is secured to the housing. In the absence of any such specific reference in the Qureshi et al. patent, it is respectfully submitted that the rejection of claims 4, 5, 13, 14 and 27 should be withdrawn.

2) Claims 2, 11, 18 and 25 were rejected under 35 U.S.C. § 103(a) as being obvious from the Qureshi et al. patent in view of U.S. Patent No. 4,591,794 to Shattuck et al. It is the Examiner's position that the Qureshi et al. patent discloses the same optical monitoring system as discussed above with respect to claims 1, etc. and that the particular use of a stainless steel bellows for housing structures associated with borescopes and the monitoring of chambers is old and well recognized in the art as exemplified by the Shattuck et al. patent. The Examiner concludes that it would have been obvious to one of ordinary skill in the art having the Qureshi et al. and Shattuck et al. references in front of him along with general knowledge to provide a stainless steel bellows as set forth in claims 2, 11, 18 and 25. For the reasons as set forth in detail below, the Applicant respectfully traverses the rejection of claims 2, 11, 18 and 25.

While it is true that the Shattuck et al. patent discloses the use of a stainless steel bellows for use with a borescope within the interior of a gas turbine engine, the Shattuck et al. patent does not make up for the deficiencies of the Qureshi et al. patent as discussed above with respect to claim 1, etc. Moreover, it is respectfully submitted that the Examiner has improperly combined the Qureshi et al. and Shattuck et al. patents. The Examiner has not pointed to an objective teaching in the Qureshi et al. patent which would lead one skilled in the art to combine it with the Shattuck et al. patent. Similarly, the Examiner has not pointed to an objective teaching in the Shattuck et al. patent which would lead one to combine it with the Qureshi et al. patent. Moreover, it is respectfully submitted that the Qureshi et al. patent actually teaches away from such a combination because, as noted above, the Qureshi et al. patent is not concerned with inspecting the interior of a sealed chamber, but, instead, is involved with inspecting the interior of an open chamber namely an open railroad tank car. Moreover, as also discussed in detail above, the Qureshi et al. patent does not disclose a flexible elongated housing made from a non-porous, hermetically sealed, corrosive resistant material as called for in claim 1. Instead, the

various segments of the device of the Qureshi et al. patent appear to be generally open to the environment. Finally, the Qureshi et al. patent teaches away from the concept of providing a sealed window to protect the optical sensor or other sensors within the interior of the housing. As discussed in detail above with the Qureshi et al. patent, the camera and related components are actually exposed to the environment within the tank car. For the foregoing reasons it is respectfully submitted that the Examiner has improperly combined the Qureshi et al. and Shattuck et al. references and as a result the rejection of claims 2, 11, 18 and 25 should be withdrawn.

3) Claim 3, 12, 19 and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Qureshi et al. patent in view of U.S. Patent No. 4,540, 258 to Chiodo. It is the Examiner's position that the Qureshi et al. patent discloses substantially the same optical monitoring system as claimed but does not specifically disclose the housing being comprised of a flexible polymeric tube. However, the Examiner's position is the use of a flexible polymeric tube for housing associated with a camera monitoring device is old and well recognized in the art as exemplified by the Choido patent. Finally, the Examiner concludes that claims 3, 12, 19 and 26 would have been obvious to one of ordinary skill in the art having the Qureshi et al. and Choido references before him/her. For the reasons as set forth below, the Applicant respectfully traverses the rejection of claims 3, 12, 19 and 26.

Claims 3, 12, 19 and 26 depend from independent claims 1, 9, 17 and 23, respectively, and, therefore, distinguish patentably over the combination of references at least by virtue of their dependency and for the reasons as discussed above with respect to independent claims 1, 9, 17 and 23. The Choido patent does not make up for the deficiencies noted above with respect to the Qureshi et al. patent.

Further, it is respectfully submitted that the Examiner has improperly combined the Qureshi et al. and Choido patents and has not pointed to an objective teaching in either of these patents which supports his combination. As discussed in detail above, the Qureshi et al. patent is concerned with the inspection of a generally open railroad tank car whereas the Choido patent is concerned with a closed system employed for inspecting the interior of a body cavity. The

Qureshi et al. device is not sealed, whereas the device of the Choido patent is clearly sealed. As discussed above with respect to claim 1, etc., the Qureshi et al. patent does not disclose or suggest the use of a sealed window whereas the Choido patent does appear to disclose a window or at least a transparent portion of the sealed housing. Accordingly, it is respectfully submitted that since the Qureshi et al. and Choido patents were not properly combined by the Examiner that the rejection of claims 3, 12, 19 and 26 should be withdrawn.

4) Claim 6, 7, 17, 20 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Qureshi et al. patent in view of U.S. Patent No. 3,778,170 to Howell et al. It is the Examiner's position that the Qureshi et al. patent discloses substantially the same optical system but does not disclose the housing including a borescope which is aligned with the sealed window. The Examiner further suggests that the Howell et al. patent discloses a borescope guide tube and teaches the conventional use of a fiber optic bundle borescope. The Examiner therefore concludes that it would have been obvious to one of ordinary skill in the art from the Qureshi et al. and Howell et al. references to develop the invention as set forth in claims 6, 7, 17, 20 and 21. For the reasons as set forth below, the Applicant respectfully traverses the rejection of these claims.

Claims 6 and 7 depend from claim 1 and claims 20 and 21 depend from claim 17. Accordingly, it is respectfully submitted that claims 6, 7, 20 and 21 distinguish patentably over the Qureshi et al. reference by virtue of their dependency and for the reasons as discussed above with respect to independent claims 1 and 17. Further, it is respectfully submitted that the Howell et al. patent does not add anything which overcomes the deficiencies of the Qureshi et al. patent with respect to independent claims 1 and 17. Accordingly, it is respectfully submitted that the rejection of claims 6, 7, 17, 20 and 21 should be withdrawn.

In addition, while the Howell et al. patent does disclose a borescope guide tube (70) which is adapted for controlling the movement of a borescope for inspecting the interior of a gas turbine engine, neither the borescope nor the guide tube of the Howell et al. patent discloses or teaches an elongated hermetically sealed housing of the type described and claimed in the present application. Further, claims 6, 17 and 21 call for the housing including a borescope

having a viewing end which is aligned with the sealed window. As discussed above, the apparatus of the Qureshi et al. patent is not sealed and does not include any type of sealed window. The borescope and guide tube of the Howell et al. patent also does not disclose or suggest a sealed housing with a sealed window. In addition, as described above, the articulated segments of the Qureshi et al. patent do not readily lend themselves to use with a borescope. Accordingly, it is respectfully submitted that the Qureshi et al. patent teaches away from the use of a borescope with a Qureshi-type housing. In addition, the Howell et al. patent teaches away from the use of an articulating apparatus of the type disclosed in the Qureshi et al. patent. Accordingly, both the Qureshi et al. and Howell et al. patents teach away from the combination of these two references and, therefore, the double reference rejection must fail. Further, the Examiner has not pointed to a specific objective teaching in either reference which would support the combination. As a result, it is respectfully submitted that claim 6, 7, 17, 20 and 21 distinguish patentably over the Qureshi et al. and Howell et al. references and the withdrawal of this rejection is respectfully requested.

5) Claims 8, 15, 16, 22, 24 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Qureshi et al. patent in view of U.S. Patent Application Publication No. 2002/0116987 A1 to Braithwaite et al. It is the position of the Examiner that Qureshi et al. discloses substantially the same optical monitoring system as discussed above with respect to claim 1, etc. The Examiner suggest that the Braithwaite et al. patent discloses an apparatus for measuring properties of material and teaches conventional fluid pressure control of an environment within the interior of a housing, temperature sensors and the use of infrared cameras for monitoring within the housing. The Examiner concludes that it would have been obvious to one of ordinary skill in the art having the Qureshi et al. and Braithwaite et al. references in front of him/her to provide the claimed subject matter of claims 8, 15, 16, 22, 24 and 29. For the reasons as set forth below, the Applicant respectfully traverses the rejection of these claims.

Claims 8, 15, 16, 22, 24 and 29 depend from claims 1, 9, 17 and 23 which, as discussed above, define patentably over the Qureshi et al. reference. The Braithwaite et al. reference does not make up for the above-discussed deficiencies of the Qureshi et al. patent with respect to the independent claims. Accordingly, claim 8, 15, 16, 22, 24 and 29 distinguish patentably over the

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combination of the Qureshi et al. patent and the Braithwaite et al. publication at least by virtue of their dependency and for the reasons as discussed above with respect to the independent claims. Accordingly, the rejection of claims 8, 15, 16, 22, 24 and 29 should be withdrawn.

In addition, it is respectfully submitted that the combination of the Qureshi et al. patent and the Braithwaite publication is improper because the Examiner has failed to point to a specific objective teaching in either reference which would support their combination. Further, it is respectfully submitted that the two references, themselves, teach away from such as combination because the Qureshi et al. patent teaches a generally open system whereas the Braithwaite et al. publication teaches a sealed or enclosed system. It is therefore respectfully submitted that the rejection of claims 8, 15, 16, 22, 24 and 29 should be withdrawn.

In view of the foregoing amendment and discussion, it is respectfully submitted that the present application including claims 1-31, as amended, is in condition for allowance and such action is respectfully solicited.

Respectfully submitted,

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